

NSTA Connection

An additional activity was added to the waves unit to address the evidence statements of 4-PS4-3: Generate and Compare Multiple Solutions That Use Patterns to Transfer Information (NGSS Lead States 2013), specifically:

- i. Knowledge of digitized information transfer
- ii. Ways that high tech devices convert and transmit information.

The activity incorporated the principals of the ASSIST approach but also included aspects of art, making it a STEAM activity. It began with a mini-lesson about abstract art in which the teacher read students the book *Touch the Art: Make Van Gogh's Bed* by Julie Appel (2006). The teacher then showed the students some images of Van Gogh's work and asked them to interpret the meaning behind the paintings. Next, the teacher asked the students whether they would like to try abstract painting, but included one caveat: "Imagine a new student with special needs moved to our classroom who couldn't use their arms or legs, could you think of a way they could be included in the abstract art activity?" This "challenge" served as the IEA and generated student ideas about how they could help their special needs peer. In the lesson, the teacher allowed students to negotiate ideas and they came up with the plan to control the paintbrush with a robot. This did not fit the criteria of a testable question because the teacher did not have access to a robot arm that could paint. However, the teacher told the students that they did have a robotic ball (Sphero, but any type of robot ball would work) and it could be used as a proxy for the paintbrush (the teacher could have given the robotic ball to the students first and then posed the question with the restrictions that we are limited to the materials at hand).

Next, the teacher and students created a plan in which they partnered with their kindergarten reading buddies. They explained abstract art (waves, and specifically how waves communicate between the iPad and the robot) and painted a picture with their buddies. After developing the plan, students decided that they would create a painting that would represent an emotion because many of their interpretations of Van Gogh's work elicited ideas of emotions in the IEA. However, before they could begin the work with their reading buddies they had to present a plan for the box that will hold the canvas (the teacher realized that without the box the robot ball would roll onto the floor and create a mess). Students had to calculate the proper area that the box would need to be to hold a 3ft \times 4ft canvas, present their plan to the teacher, and then build their box.

After the box was built the teacher asked the students to work in small groups to prepare a short oral presentation to their kindergarten buddies about how the iPad was communicating with the robot through waves. The criteria for the presentation is listed, and students were asked to individually write a script before they were allowed to present. The student scripts were an example of formative assessment that the teacher used to help determine how well each student understood the concept.

During the painting day, the students were split into four different groups and the kindergarten teacher and classroom aids helped each group place the canvas into the box, dip the robot ball into paint, place the robot on the canvas, watch the students "drive" the ball, wash the robot, and place the paintings in a safe place to dry. While the other teachers were helping the students make their paintings the fourth grade teacher moved from group to group listening and scoring each student's oral presentations about waves.